

7. PROPOSED RECOVERY GOALS AND STRATEGIES

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This section describes an array of goals and objectives for nearshore and marine aspects of salmon recovery in Puget Sound and describes strategic approaches that we believe are best suited to frame nearshore and marine recovery actions. We have reserved discussion of recovery goals for this point in this document because our thinking about desired outcomes has been informed by the material presented in earlier sections, including the geographic evaluation of sub-basins in Section 6.

This presentation of proposed recovery strategies is intended to demonstrate that they (1) are consistent with the hypotheses presented in Section 5, (2) follow from the results of the sub-basin evaluations presented in Section 6, and (3) represent a logical and focused approach to achieving our goals and objectives.

The statements of goals and strategies proposed in this section have not been vetted beyond the small group of people who developed this document. We appreciate that development of goals and strategies should be undertaken in broad collaboration with affected parties. Therefore, we suggest that the goals, objectives, and strategies introduced in this section be considered as straw-man proposals that can be used to initiate and facilitate discussion and development of consensus policy statements on these issues.

7.1 Recovery goals and objectives

In Section 1, we introduced a set of goal statements identified in mid-2004 by a Nearshore Policy Group that PSAT and Shared Strategy convened to assist with development of this document. Those statements actually prescribe a strategy to achieve the outcomes we desire related to nearshore and marine ecosystems for recovery of salmon and bull trout. This subsection steps back a bit in the strategy development process to articulate desired outcomes as the goals and objectives for the regional nearshore and marine aspects of Puget Sound salmon and bull trout recovery. We are suggesting goals and objectives related to improvements in three different realms:

- viability of salmon and bull trout populations and functioning nearshore and marine ecosystems to support them;
- confidence that strategies and actions are well targeted to accomplish recovery;
and
- stewardship of nearshore and marine ecosystems to benefit salmon recovery.

Our proposed goal statements represent desired long-term outcomes. Objectives under various goals might be short-term (e.g., next biennia or next decade) or long-term. Some

proposals are specific about the temporal nature of the desired outcome, others are not yet specific but should be refined through future discussions.

7.1.1 Goals and objectives for salmon and bull trout populations and nearshore and marine ecosystems

The subsections below identify overarching goals and more detailed objectives for salmon and bull trout populations and nearshore and marine habitats and ecosystem processes.

(1) Salmon and bull trout populations

One overarching goal is to achieve viable salmon and bull trout populations. Attaining this goal will require contributions from across this recovery plan (not just this document). Nearshore- and marine-specific objectives for Chinook and Hood Canal summer chum salmon and the region's marine migrant bull trout include:

Chinook abundance and productivity: Increased numbers of outmigrant juvenile Chinook and improved marine productivity of Chinook. The co-managers' analysis of planning targets for outmigrants and spawners TRT (2002) suggests that the desired future condition includes increased abundance of outmigrant juveniles (2 to 28 times recent levels) and, for many populations, increased marine productivity (no change to a 5-fold improvement relative to recent conditions). Specific objectives would be to establish, in 10 years, a recovery trajectory consistent with the longer-term attainment of the co-manager's stated targets for abundance and implied targets for marine productivity.

Co-managers' analysis presented by the TRT (2002) suggests the magnitude of change in abundance of juvenile outmigrants to achieve planning targets range from 2 to 28 times recent average abundances.¹ A portion of this range reflects differences across populations and a portion reflects the effect of variable assumptions about (recruit to spawner) productivity on abundance targets. For example, abundance targets for the low productivity situation are 28 times recent averages for the North Fork Nooksack population but only 3 times recent averages for Puyallup and Nisqually populations. If we shift to the high productivity situation, the magnitude of change for abundance of the North Fork Nooksack population is reduced to 20 times recent averages.

We derived estimates of recent and anticipated future marine productivity for eight of 22 populations using the co-managers analysis presented by the TRT (2002). Spawner-to-outmigrant ratios for recent averages presented by the co-

¹ This magnitude of change reflects analysis of 8 of 22 independent populations in five natal river systems. Magnitude of change in outmigrant abundance desired in other systems may not be within this range. For instance, the TRT (2002) suggests the abundance of spawners in the Skagit River system may not need to increase over recent average levels; this does not necessarily imply that no increase in outmigrants is needed in this system.

managers fall in the range of 0.3 to 1.1 percent. These ratios are not held constant in the planning targets; the spawner-to-outmigrant ratios calculated from the planning targets provided by the co-managers range from 0.4 to 3.5 percent. This implies that the co-managers envision an improvement in outmigrant-to-spawner productivity for some populations. It is not clear how much of this desired improvement might be attributed to improved conditions in Puget Sound nearshore and marine environments.

- Chinook life history diversity: Maintain Chinook life history diversity with increased support for fry that rear in nearshore environments.
- Chinook spatial structure and ecological diversity: Expand Chinook ESU spatial structure and ecological diversity by supporting viability of populations in each of the regions. Expand Chinook population spatial structure and ecological diversity by improving nearshore and marine rearing and productivity for the various life history types in each sub-basin.
- Hood Canal Summer Chum -- Maintain current population structure and distribution of summer chum and restore distribution in previously occupied areas within the species native range. (This is the goal provided in Hood Canal Coordinating Council's June 2005 summer chum recovery plan.)
- Bull Trout -- Maintain the current distribution of bull trout anadromy and restore migratory life history forms in some of the previously occupied areas. Maintain stable or increasing trends in abundance of bull trout. (These are two of three objectives listed in USFWS (2004) bull trout recovery plan.)

(2) Nearshore and marine habitats and ecosystem processes

A second overarching goal is to achieve and maintain nearshore and marine conditions that support recovery of the region's salmon and bull trout populations. Near-term progress toward this long-term goal might be focused on the following objectives:

- Maintain the functioning of shallow, fine substrate features in and near 11 natal estuaries for Chinook (to support rearing of fry).
- Maintain migratory corridors along the shores of Puget Sound.
- Maintain the production of food resources for salmon.
- Maintain functioning nearshore ecosystem processes (i.e., sediment delivery and transport; tidal circulation) that create and support the above habitat features and functions.

- Increase the function and capacity of nearshore and marine habitats to support key needs of salmon.
- Restore and maintain suitable habitat conditions for anadromous bull trout life history stages and strategies. (This is a paraphrase of one of three objectives listed in USFWS (2004) bull trout recovery plan.)

Progress toward these objectives might be assessed by evaluating status and trends of the following conditions in 10 years relative to the current situations for:

- shallow, low velocity, fine substrate habitats along marine shorelines, including eelgrass beds and pocket estuaries, especially adjacent to major river deltas;
- riparian areas
- estuarine habitats of major river mouths;
- spawning areas and critical rearing and migration habitats for forage fish;
- freshwater sources that directly affect estuaries and marine shorelines and processes that control the delivery rate and chemical and sediment content of freshwater; and
- drift cell processes (including sediment supply, e.g., from feeder bluffs, transport, and deposition) that create and maintain nearshore habitat features such as spits, lagoons, bays, beaches.

7.1.2 Goals and objectives related to confidence in nearshore and marine contributions to recovery

In light of the combined urgency, importance, potential expense, and uncertainty of nearshore and marine aspects of salmon recovery, a third overarching goal is to increase our and others' confidence that nearshore and marine recovery actions and ecosystem conditions are supporting salmon recovery.

Progress toward this goal of increased confidence might be focused on the following objectives:

- Increased scientific understanding of relationships between viability of salmon and bull trout populations, nearshore and marine habitat conditions, and habitat management actions. This might be measured by progress over 10 years' time to develop (and publish) and use quantitative models of the effects of habitat alterations on salmon population viability.
- A commitment to acquire and use new information to revise and adapt recovery efforts. This might be measured by implementation over 10 years' time of an adaptive management cycle including revisions to recovery hypotheses, goals, and/or strategies and adaptation of recovery actions.
- Assurance that land development activities and individual and institution behaviors protect functioning habitats and processes. This might be measured by

positive changes seen in the effectiveness of regulatory programs as demonstrated through periodic reviews over 10 years' time,

- Positive trends in measures of ecosystem functions and processes and productivity salmon and bull trout populations in nearshore and marine environments. Specific measures related to this outcome are discussed above in Section 7.1.1.

7.1.3 Goals and objectives for stewardship of nearshore and marine ecosystems

A final overarching goal is that Puget Sound citizens and institutions will develop a commitment to stewardship of nearshore and marine ecosystems and that this commitment will be demonstrated through development, land management, and personal and institutional behaviors that support salmon recovery.

Progress toward this goal of increased stewardship might be focused on:

- Broad engagement in recovery efforts and stewardship:
 - Recovery planning represents all key stakeholders and specifies a reasonable breadth of actions and implementers. This can be assessed by review of recovery plan processes and deliverables.
 - Number and proportion of people thinking about needs of salmon and bull trout as an influence on their behaviors. This might be assessed by (periodic social research of) trends in attitudes, values, and behaviors.
 - Stakeholders commit to recovery actions or agree to discuss conditions and commitments. This can be assessed by review of recovery efforts.
- Individual and collective decisions that consider nearshore and marine habitat needs of salmon while also supporting other interests
 - Individuals and organizations evaluate the region's well-being based on condition of ecosystem processes, habitats, salmon, biodiversity, and other species. This might be measured by trends in the popular use (e.g., in the media) of broad measures of well-being (e.g., the indicators developed and tracked by Northwest Environment Watch).
 - Public discourse (e.g., in editorials and letters to editor, in challenges to land use decisions) shifts from discussion of protecting property rights to acknowledgement of the constraints of salmon-appropriate behavior within the scope of one's rights.
 - Consideration of long-term effects of actions and public interests in natural resources and privately-owned properties. This might be assessed by (periodic social research of) trends in attitudes, values, and behaviors.

7.2 Recovery Strategies

Building from the goals and objectives proposed in subsection 7.1, the hypotheses presented in Section 5, and the results of geographic analyses presented in Section 6, we propose an array of strategic approaches for nearshore and marine aspects of salmon recovery that we suggest could form the basis for identification of specific recovery actions. This subsection names our strategies and explains how we believe they derive from our hypotheses and how they will help us achieve our goals and objectives.

7.2.1 Protect functioning habitat and high quality water commensurate with the needs of viable salmon and bull trout populations.

The first major strategic approach is to protect current levels and types of functions for salmon and bull trout. Elements of this strategic approach are itemized in Table 7.1. These strategies help achieve the goals and objectives for maintaining conditions of nearshore and marine ecosystems, improved confidence in recovery, and improved stewardship. Protection efforts will not be sufficient to improve salmon and bull trout viability or to increase functioning of nearshore and marine habitats for these fish but they are a logical prerequisite for more aggressive habitat actions and, most importantly, help preserve resources for future generations of salmon and options for future adaptations of recovery efforts.

Efforts to implement this strategy will involve various authorities, decisions, and commitments, each of which will require a balance between commitment to habitat protection (to support salmon recovery) and other interests in marine shorelines (e.g., residential or commercial development).

7.2.2 Improve the function of habitats and the quality of marine and estuarine waters by strategic and locally-acceptable actions to restore, rehabilitate, or substitute for natural ecosystem processes

Nearshore and marine habitat and water quality improvements appear to be needed in many areas of Puget Sound to increase the capacity of nearshore environments to support more abundant outmigrant juveniles and increase the marine productivity of select populations. Therefore, strategic efforts to restore, rehabilitate, or substitute for nearshore and marine processes and conditions represent our second major recovery approach. Table 7.2 details proposed elements of this strategic approach.

Restoration, rehabilitation, and substitution efforts will help us achieve our goals of increased viability of populations, increased function of nearshore and marine habitats, increased confidence in recovery, and increased stewardship.

Restoration or rehabilitation of tidal exchange processes in river mouth estuaries is occurring at many locations around Puget Sound (e.g., Nisqually, Skagit, Skokomish, Snohomish, and Jimmycomelately estuaries). Through these experiences we feel rather

certain that such projects can and do affect processes. Substantial questions remain, however, about the effects of such actions on salmon and bull trout viability.

Clean up of contaminated water bodies (e.g., those designated as contaminated sediment sites or as impaired waters) is currently being pursued at many locations around Puget Sound. Programs to accomplish these clean ups include contaminated sediment site cleanup under federal and state authorities, development and implementation of waterbody cleanup plans (TMDLs) for impaired waters, shellfish protection districts, and a major endeavor to improve water quality in Hood Canal. These efforts provide some evidence of success in affecting biological conditions by contaminant clean up (e.g., sediment capping at Eagle Harbor reduced incidence of liver lesions in English sole (PSAT 2002)). However, efforts under these programs are typically not targeted to salmon recovery goals and objectives and substantial questions remain about the effects of such actions on salmon and bull trout viability.

Other types of improvements as detailed in Table 7.2 are less well proven and understood. Where these types of projects are pursued and implemented, we would expect that there could be considerable information developed about the effectiveness of these projects in restoring processes and affecting salmon and bull trout viability.

7.2.3 Conduct research, monitor conditions and actions, and evaluate recovery actions to support the refinement of management strategies and actions

As discussed earlier in this section and throughout this document, recovery of salmon, protection of functioning nearshore and marine habitats, and effective restoration of nearshore habitats or processes are all uncertain propositions. Therefore, we propose a third major strategic approach: collect and evaluate information to support future refinements to recovery hypotheses, goals and objectives, strategies, and actions. Strategic elements of this approach are identified in Table 7.3. All address the goal of increasing confidence in recovery.

Table 7.1: Protection of Functioning Habitat and High Water Quality

Strategy	Goals and objectives addressed	Relation to hypotheses and sub-basin evaluations
Implement existing voluntary and regulatory protection programs to maintain functions and water quality for salmon and bull trout	Maintaining nearshore and marine conditions that support recovery Increased stewardship – related to opportunities for voluntary actions by a large number of landowners	Protection targets are identified in hypotheses 4 & 5 and in sub-basin evaluations Stressors to be addressed to protect functions are suggested by hypothesis 7 and specifically identified in sub-basin evaluations
Evaluate effectiveness of existing programs	Increased confidence in recovery – related to assurance that recovery actions are effective	Protection targets identified in hypotheses 4 & 5 and in sub-basin evaluations Stressors to be addressed to protect functions are suggested by hypothesis 7 and specifically identified in sub-basin evaluations
As needed, design and implement refinements (including voluntary and regulatory innovations) to achieve protection of functions and water quality	Maintaining nearshore and marine conditions that support recovery Increased confidence in recovery – related to assurance that recovery actions are effective Increased stewardship – related to opportunities for voluntary actions by a large number of landowners	Protection targets identified in hypotheses 4 & 5 and in sub-basin evaluations Stressors to be addressed to protect functions are suggested by hypothesis 7 and specifically identified in sub-basin evaluations Preference for process-based protection is specified in hypothesis 8.
Regionally-focused organizations and local communities should collaborate to prevent catastrophic events and/or protect nearshore habitat features from catastrophic events ¹	Maintaining nearshore and marine conditions that support recovery (and increased viability of salmon and bull trout) Increased confidence in recovery – related to relative assurance that major events might be avoided or quickly remediated.	Protection targets are identified in hypotheses 4 & 5 and in sub-basin evaluations Stressors to be addressed to protect functions are suggested by hypothesis 7 and specifically identified in sub-basin evaluations

¹ Prevention and protection should be targeted to reduce risks in susceptible areas (as defined by vessel traffic, storm conditions, response constraints, and other risk factors); key nearshore environments such as natal estuaries for salmon and forage fish spawning areas; and major migratory routes such as Admiralty Inlet, Tacoma Narrows, Deception Pass and the San Juan Islands.

Table 7.2: Improve the Function of Nearshore Habitats by Restoration, Rehabilitation, or Substitution

Strategy	Goals and objectives addressed	Relation to hypotheses and sub-basin evaluations
Pursue and implement locally acceptable projects to improve tidal exchange processes in river mouth estuaries	<p>Achieving and maintaining nearshore and marine conditions that support recovery</p> <p>Increased viability of Chinook – especially by support for sensitive life history types – and other salmon and bull trout</p> <p>Increased confidence in recovery from: information about effects on viability; assurance that sensitive life history types receive support</p>	<p>Restoration of tidal exchange processes derives from hypotheses 1, 2, 4, and 8.</p> <p>Opportunities for improved tidal exchange are identified in sub-basin evaluations.</p>
Analyze water and sediment quality issues in impaired areas and implement sediment and water quality cleanup activities – focused on control or elimination of sources or restoration of natural hydrology – to achieve water quality standards and ensure conditions support viable salmon and bull trout populations	<p>Achieving and maintaining nearshore and marine conditions that support recovery</p> <p>Increased viability of Chinook – especially by support for sensitive life history types – and other salmon and bull trout</p> <p>Increased confidence in recovery from: information about effects on viability; assurance that sensitive life history types receive support</p>	<p>Improvement of water and sediment quality derives from hypotheses 1, 4, and 5.</p> <p>Opportunities for water quality improvements are identified in sub-basin evaluations.</p>
Pursue and implement locally acceptable projects to improve the function of marine shorelines, particularly pocket estuaries, eelgrass beds, and other shallow, low velocity, fine substrate habitats adjacent to major estuaries	<p>Achieving and maintaining nearshore and marine conditions that support recovery</p> <p>Increased viability of Chinook – especially by support for sensitive life history types – and other salmon and bull trout</p> <p>Increased confidence in recovery from: information about ability to restore function and to affect viability; assurance that sensitive life history types receive support</p> <p>Increased stewardship – related to opportunities for actions by a large number of landowners</p>	<p>Restoration of shoreline conditions adjacent to major estuaries derives from hypotheses 1, 2, 4, and 8.</p> <p>Opportunities for improved shoreline function are identified in sub-basin evaluations.</p>

Strategy	Goals and objectives addressed	Relation to hypotheses and sub-basin evaluations
Pursue and implement locally acceptable projects to improve sediment delivery from sources such as feeder bluffs, river and creek discharges, and sediment transport processes to support habitat formation and function	<p>Achieving and maintaining nearshore and marine conditions that support recovery (and increased viability of salmon and bull trout)</p> <p>Increased confidence in recovery from information about ability to restore function and to affect viability</p> <p>Increased stewardship – related to opportunities for actions by a large number of landowners</p>	<p>Restoration of sediment delivery derives from hypotheses 1, 2, 4, and 8.</p> <p>Opportunities for improved sediment delivery are identified in sub-basin evaluations.</p>
Pursue and implement locally acceptable projects to improve marine riparian functions related to water quality, food production, and refuge	<p>Achieving and maintaining nearshore and marine conditions that support recovery (and increased viability of salmon and bull trout)</p> <p>Increased confidence in recovery from information about ability to restore function and affect viability</p> <p>Increased stewardship – related to opportunities for actions by a large number of landowners</p>	<p>Restoration of marine riparian functions derives from hypotheses 1, 2, 4, and 8.</p> <p>Opportunities for improved sediment delivery are identified in sub-basin evaluations.</p>
Facilitate the development and implementation of restoration programs and projects to support improvements in all sub-basins of Puget Sound	<p>Increasing viability of Chinook salmon – by support for spatial structure</p> <p>Increased confidence in recovery from assurance that spatial structure receives attention</p>	Restoration in all sub-basins derives from hypothesis 5.

Table 7.3: Research, Monitor, Evaluate, and Refine Hypotheses, Goals, and Strategies

Strategy	Goals and objectives addressed	Relation to hypotheses and sub-basin evaluations
Conduct studies and collect information to test hypotheses about nearshore and marine ecosystem processes and to evaluate the effects of strategies and management actions on nearshore and marine ecosystems	Increased confidence in recovery from evidence of effectiveness, support for hypotheses, and/or assurance of commitment to adaptation.	Would test hypotheses 1, 2, and 8. Would provide for evaluation of implemented actions
Designate and initiate studies of an intensively monitored shoreline to focus and organize efforts to test hypotheses about effects of shoreline ecosystems (and shoreline restoration) on salmon viability	Increased confidence in recovery from evidence of effectiveness, support for hypotheses, and/or assurance of commitment to adaptation.	Would test hypotheses 3, 4, 5, and 6.
Use the intensively monitored Skagit Delta to organize studies to test hypotheses about effects of estuaries (and estuary restoration) on salmon viability	Increased confidence in recovery from evidence of effectiveness, support for hypotheses, and/or assurance of commitment to adaptation.	Would test hypotheses 3, 4, 5, and 6.
Conduct studies to test hypotheses about the effects of stressors/threats on salmon individuals, life history types, and populations	Increased confidence in recovery from evidence of effectiveness, support for hypotheses, and/or assurance of commitment to adaptation.	Would test various elements of hypothesis 7.
Convene management conference to refine hypotheses and adapt strategies and actions	Increased confidence in recovery from assurance that strategies and actions will be re-directed based on new information	Would suggest revision of hypotheses and sub-basin evaluations.